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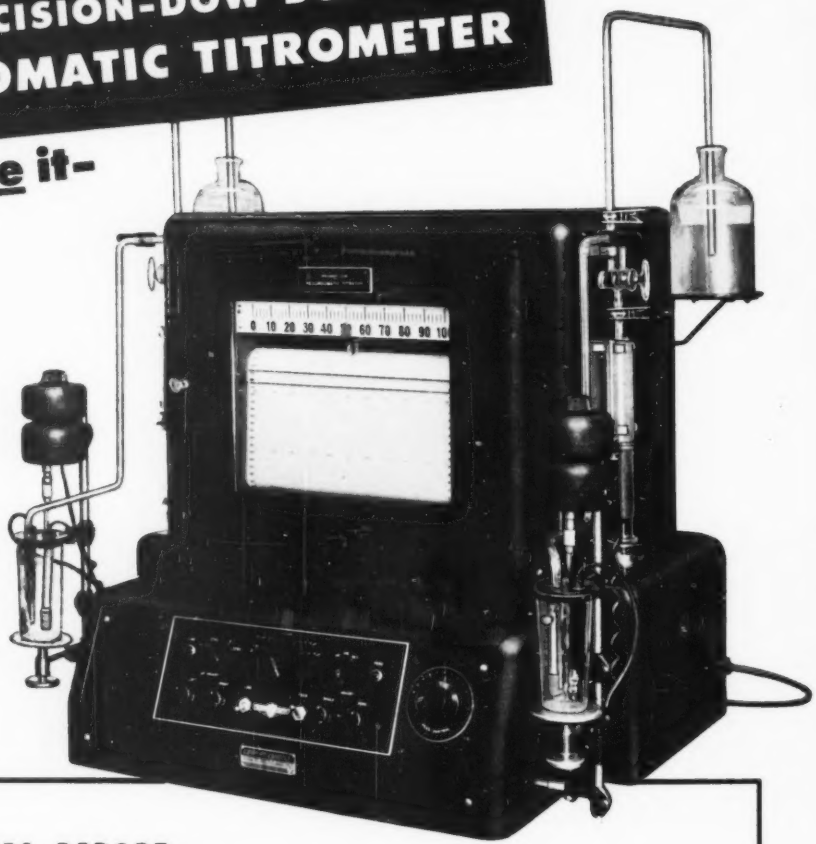

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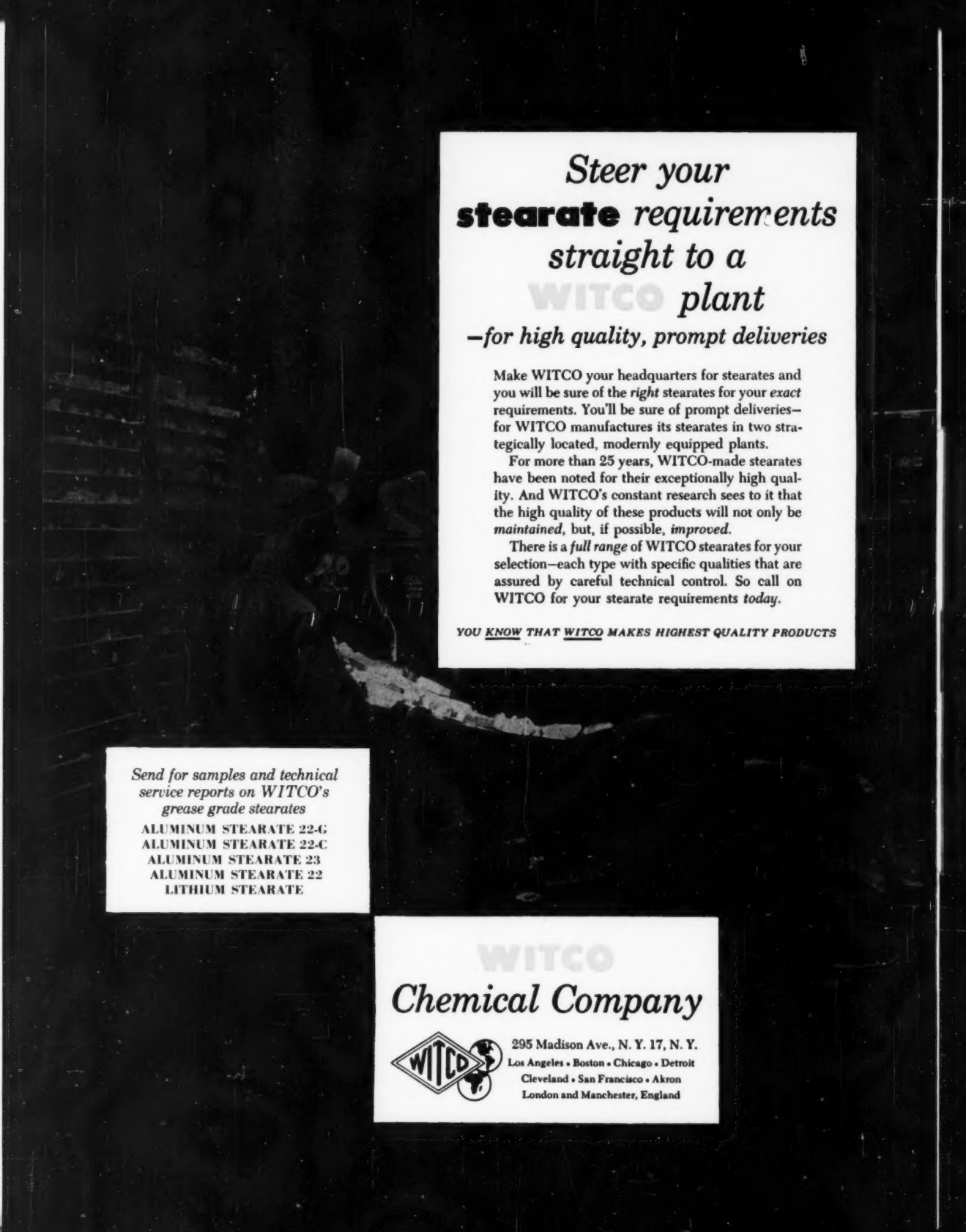

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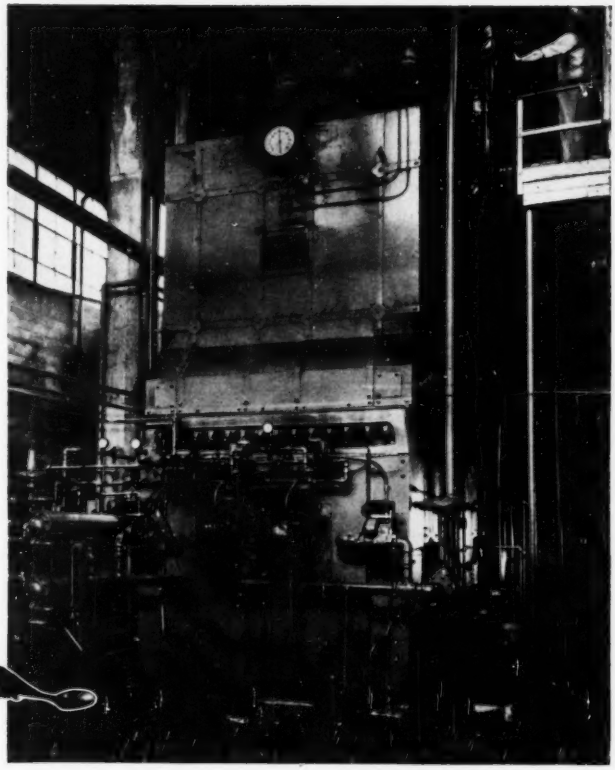

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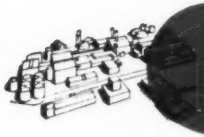

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ABOUT THE COVER . . .

The fractionation still and the Beckman Ultraviolet Spectrophotometer illustrated are two important tools utilized by the Chemical Staff of Emery Industries to determine the basic composition of commercial fatty acids.

Essentially, the distillation unit consists of a column 4 feet in height and approximately 1 inch in diameter packed with a modified Stedman packing, which provides excellent efficiency. Normally, fractionation is carried out at 5 mm absolute pressure and external heaters maintain adiabatic conditions throughout the column. With this unit, it is possible to determine accurately the amounts of each of the saturated acids (Myristic, Palmitic, Stearic, etc.) present in commercial fatty acids. Actually, the methyl esters are fractionated, since distillation occurs at lower temperatures and decomposition is practically eliminated. The results obtained by interpretation of the distillation curves are usually reproducible within 1.0%. For even closer determinations, saponification and iodine values are obtained on each separate fraction and results corrected accordingly.

The polyunsaturated fatty acids (Linoleic, Linolenic, Arachidonic) are determined by the Beckman Ultraviolet Spectrophotometer. By comparing the percent ultraviolet transmission of unknowns to that of the pure acids, the content of each polyunsaturated acid can be calculated. The proportions of conjugated and non-conjugated acids (double bond arrangement) can also be calculated.

Results obtained from these two analytical devices together with the usual laboratory determinations of iodine value, saponification value, etc., furnish a very accurate picture of the composition of any commercial fatty acid.

Results to date show that fatty acid composition is an important factor in end properties of greases and this type of data furnishes Emery's Chemical Staff information which enables them to account for some of the differences that are noted in the production of lubricating greases . . . Another step to provide better fatty acids for better greases.

President's page

by Arthur J. Daniel, President, N.L.G.I.

Although caution is a primary business virtue, even the most pessimistic member of the Lubricating Grease Industry can visualize in 1950 a year of prosperity and progress. Certainly, there is every indication that this year will be one of the most prosperous we ever have enjoyed.

The fortunes and destiny of the Industry are, of course, linked closely with those of our national economy. And it is here that we can find the pattern of coming months. Despite six years of continuous post war prosperity, a heretofore unprecendented record, we find the nation's business expanding, the income of the average citizen rising steadily, and every economic sign post pointing towards a healthy business economy.

Our specific interest, of course, lies in the immediate future of the Petroleum Industry, and here we find unmistakable signs that prosperity is all around us.

In the transportation field more automobiles, trucks, and busses than ever before are on the roads and highways. Record production in automotive factories will make even more of these vehicles available. To meet this new demand the number of operating filling stations is increasing. Everywhere we turn the transportation field is creating new and larger markets for petroleum products. The director of research for one of the nations largest advertising agencies has estimated that auto accessory and part sales will increase 10% in 1950. And the sales of petroleum products stand to gain their proportionate share.

Year after year of continuous prosperity on the farm has enabled the farmer to pay off mortgages and invest in modern agricultural machinery. The development of modern farming methods has increased the need for Lubricating Greases and the sales volume in this field is destined to reach new peaks. For there is more horse-power working the fertile hills, valleys, and plains than there is in any other industry.

Industrial expansion, accelerated technological developments, and the design and production of new petroleum consuming devices are placing heavy demands on our industry. We shall, as in the past, continue to keep pace with these new demands and, in so doing, build for petroleum's future.

There can be no doubt in our minds that 1950 holds a promise of being a prosperous year for the Lubricating Grease Industry.

Plant for Continuous Grease

". . . Continuous blending of soap base and lubricating oil appeared to offer a more promising method of achieving still greater efficiency and lower manufacturing costs."

THE AUTHOR

H. E. Bloomsburg was graduated from John Hopkins, received his M.A. and Ch. E. degrees from Columbia University and joined the Development Department of the Esso Standard Oil Company in 1924. After two years of research on motor fuels and lubricants, culminating in investigation of motor fuel problems in England, Germany, and Denmark, he was appointed assistant technologist in the Manufacturing Department in the New York office. In his continued association with the Manufacturing Department his work involved product quality and development, and the technical coordination of these activities between Marketing, Manufacturing, and Research Units. He has contributed to the expansion of Esso Standard's Solvent Naphtha business and was instrumental in establishing its present line of Aromatic Solvents. He has been intimately associated also with Esso's grease activities since 1929.

In his present capacity, Mr. Bloomsburg is responsible for coordination of quality of all major products and for coordination of quality and supply of greases, solvents, aviation gasoline, and specialties. He is a member of most of Esso's product subcommittees and is Chairman of the Grease and Specialties Subcommittees. He is a member of the American Chemical Society.

SUMMARY

Commercial production has been initiated on continuous manufacture of calcium soap grease. The full scale operation which will be discussed consists, in essence, of three basic steps:

1. Calcium grease base manufacturing and handling.
2. Oil storage, blending and delivery to the grease manufacturing unit.
3. Continuous blending of the calcium grease base and oil to produce cup and chassis grease.

Additional equipment for the continuous operation includes consistency control of the product, packaging and shipping of the finished greases and the continuous blending of extreme pressure lubricants. Compounded oils are blended kettlewise in the grease plant area and packaged there but have been successfully made using the extreme pressure lubricant continuous unit.

In this presentation the use of the terms "yield" and "grease yield" refer to the amount of grease of desired consistency which can be produced from a given amount of soap or fat, i.e., for a given penetration, high yield is synonomous with low soap content.

INTRODUCTION

Progress in grease technology in recent years has resulted in improvements in the manufacture of calcium soap greases by the kettle method to the point that maximum efficiency is being approached for this type of operation. Continuous blending of soap base and lubricating oil appeared to offer a more promising method of achieving still greater efficiency and lower manufacturing costs.

Since calcium grease bases are semi-plastic at temperatures above 200°F and can be pumped in this temperature range, it appeared possible that a grease base containing a small percentage of lubricating oil and the requisite amount of water for a finished grease could be mixed with hot oil to produce grease, using a centrifugal type pump which exerts a high degree of turbulent mixing.

The correctness of this basic concept was demonstrated in the laboratory using a small centrifugal pump to which were fed simultaneously a calcium grease base and a lubricating oil. The work indicated that uniformly good quality products might be made, with grease yield values superior to those obtained using kettle equipment.

A sufficient amount of work was carried on at the laboratory level to aid in designing a pilot plant unit for large scale studies carried out under plant conditions.

PILOT PLANT

The Pilot Plant studies on continuous manufacture of calcium greases indicated that a two-step process offered the best possibilities for the continuous blending of calcium grease base and lubricating oil. The first step involved the semi-continuous manufacture of a calcium soap base including, roughly, 20% mineral oil and about 7% water. The second step consisted of blending this calcium grease base with lubricating oil using a Lancaster Disperser. This work was described in some detail by Houlton, H. G.; Calkins, A. E.; and Beerbower, A.; in a paper entitled "Continuous Process for Lubricating Greases"; Chemical Engineering Progress, August, 1947.

The Pilot Plant work had indicated the feasibility and economic advantage of continuously blending calcium grease base and lubricating oil, and accordingly a full scale plant was built and has been in operation since October 1948 at the Baltimore Refinery of the Esso Standard Oil Company. In our discussion of the full scale plant, we propose to describe the component units of the plant and then to discuss their operation, including package filling and handling and the economics of the unit.

Manufacture

by
H. E. Bloomsburg and A. Beerbower,
Esso Standard Company

CALCIUM GREASE BASE MANUFACTURE

The manufacture of calcium grease base is on a semi-continuous basis involving a closed pressure system. A diagram of the Rapid Soap Cooker unit is shown in Figure 1.

This unit consists of three pressure drums together with one heat exchanger and one pump. Each drum is capable of handling about 2,000 pounds of grease base and a typical charge includes the following:

1,230 Lbs. Animal Fat
174 Lbs. Hydrated Lime
74 Lbs. Water
422 Lbs. Mineral Oil

In plant operation the animal fat is pumped from field storage tank to a scale tank located at the Rapid Soap Cooker, and the required amount, weighed to the nearest pound, is charged to one pressure drum. Lime is weighed accurately, slurried with a pale lubricating oil of about 300 viscosity SSU at 100°F by means of a rotary impeller and an orifice mixer, then charged to the pressure drum by means of a reciprocating slurry pump. After the proper amount of water has been pumped in, the slurry tank is washed free of slurry by pumping the balance of the lubricating oil through the slurry tank into the drum. All charging lines are blown free with compressed air, vents are closed and the proper valve settings made in preparation for the soap cooking operation. A diagrammatic sketch of the fat/lime system is shown in Figure 2.

By circulating the charge through the heat exchanger and back to the drum by means of a gear pump, a temperature of 325°F (and 80 psig) is reached in about 20 minutes and saponification is found to be 99.5% complete in about one hour. This is in contrast with the four to six hours saponification time required in an open kettle with the same ingredients. The curve shown in Figure 3 indicates the rapidity with which saponification is effected with the rapid soap cooker type of equipment.

At the end of an hour of circulation, a sample of soap base is withdrawn and the free calcium oxide content is determined. If the soap base contains less than 0.2% free CaO but is not acidic, it is considered satisfactory for use. Adjustments would be made to the soap base if it did not meet these requirements but, as a consequence of careful laboratory control of raw materials, such adjustments seldom have been necessary.

After the calcium grease base has been approved, the first drum of the unit is cut off from the heat exchanger and

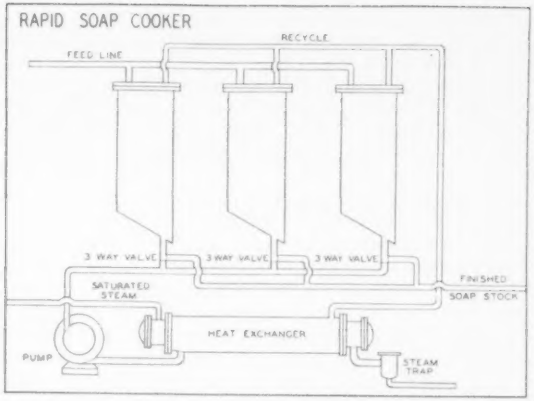


Figure 1. Diagram of the Rapid Soap Cooker.

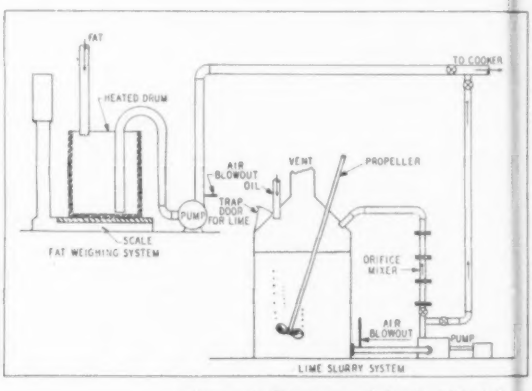


Figure 2. Diagram of the Fat Weighing and Lime Slurry System.

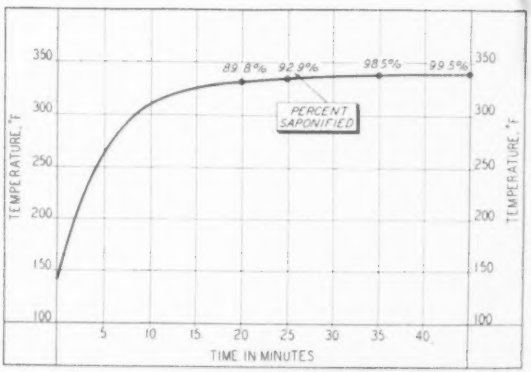


Figure 3. Chart showing Saponification Rate with the Rapid Soap Cooker.

pump by means of a three-way valve. The drum is pressured with air at 100 pounds per square inch which forces the grease base through a steam-traced line to the grease base metering unit. Pressuring with air also serves to prevent loss of water from the grease base. Meanwhile the second drum of the Rapid Soap Cooker is charged and saponification started. By repeating this sequence, sufficient grease base can be made in the three drums to provide an uninterrupted supply of calcium grease base to the grease blending unit.

OIL BLENDING AND HANDLING

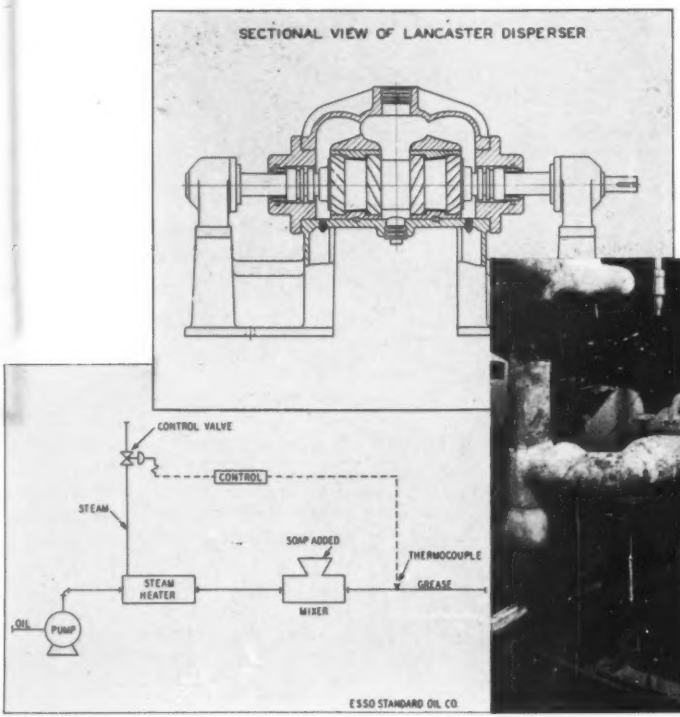
Oil for the continuous grease blending units is obtained from three house tanks, each having a capacity of 3,000 gallons. Each tank has sufficient capacity for one day's operation of one grease blending unit. In actual operation the three house tanks serve two grease blending units which have been divided for convenience into a pale oil and a red oil system. By having the extra tank, oil blends can be prepared for use at a later time without interfering with current grease blending operations. The oil in these tanks can be heated for facilitating blending which is accomplished by agitating with compressed air. Since the temperature at which the finished grease is drawn influences the yield, it is essential that the oil entering the Lancaster Disperser be at the correct temperature. The control of oil temperature is effected by a heat exchanger and temperature controller actuated by the grease temperature at the exit side of the Lancaster Disperser. Figure 4 illustrates the oil blending and temperature control system.

The house tanks are connected to field tanks by steam traced lines. Meters which can be set to deliver a predetermined quantity are used at the house tanks so that the grease plant operators can start pumping oil from the field and then go about other duties while the house tanks are being filled. By this method the efficiency of the grease plant personnel is greatly increased.

CALCIUM GREASE BASE — OIL BLENDING

The success of the continuous grease plant operation is due in large part to the mixing efficiency of the Lancaster Disperser which was found to be a much better blending unit than a centrifugal pump such as used in the laboratory development work. The Lancaster Disperser operates at 3600 RPM and employs a turbine rotor mixing principle. This unit is illustrated diagrammatically in Figure 5. The Lancaster Disperser automatically recycles within itself, the amount of recycling being controlled by the input feed rate. A 15 horse-power motor is used to drive this unit.

In actual operation the oil and grease base streams are separately fed through individual flow meters to the Lancaster in predetermined ratios designed to produce the desired grade of grease. This predetermined proportioning of base to oil is effected by variable speed drives actuating the base and oil metering pumps. These drives can be inter-



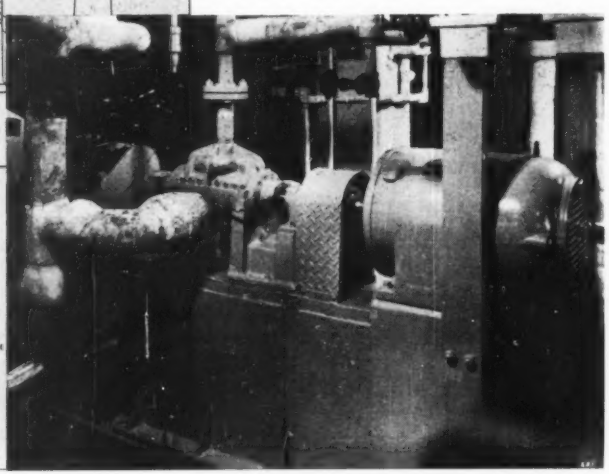


Figure 4. (Below, left) Diagram showing Oil Temperature Control.

Figure 5 (Left) Diagram of Sectional View of the Lancaster Disperser.

Figure 6 (Below) Photograph of the Lancaster Disperser.

locked after adjustment to maintain constant base to oil ratio throughout the run. The excellent flexibility of this proportioning drive permits minor variation of base to oil ratio during the run to maintain grade consistency, or major variation when changing to a different grade during the run. A variable speed drive ahead of the proportioning drive controls the total feed to the Lancaster without affecting grease base to oil ratio and thus controls grease throughput at any desired level up to the 50 pounds per minute presently obtained.

The Lancaster Disperser holds about two pounds of grease and by keeping the length of line from the disperser to the packaging equipment to a minimum, it has been found possible to make a change in grease grade while operating, and not produce in excess of 40 pounds of off-grade grease. The continuous unit has produced excellent quality greases from Number 00 through Number 4 N.L.G.I. classifications when operating at capacity of approximately 50 lb./minute. The blending of a high percentage of grease base at 335°F with lubricating oil to give harder than No. 4 grease can be accomplished with one Lancaster but the exit temperatures are above 210°F and consequently loss of water occurs. This could be controlled by the use of a cooler. However, since the attractiveness of the continuous operation depends chiefly upon large volume production, and since the demand for greases softer than No. 00 and harder than No. 4 is relatively small, kettle production of these grades is preferred to the use of the continuous blending facilities.

To prevent boiling in the lines and ensure a steady flow of grease base from the metering pump throughout the Lancaster Disperser, a pressure controller and indicator is installed on the exit side of the Lancaster Disperser. This is set to maintain this part of the system under 50 pounds pressure.

CONSISTENCY CONTROL

After leaving the Lancaster, the grease passes through a motor driven strainer. Between this and the package filling point, the grease stream is sampled by a continuous viscosimeter for consistency control with the measured sample being returned to the stream.

The continuous viscosimeter used on these units is a special form of the S.O.D. Pressure Viscosimeter (1) and operates on the principle that, under fixed condition of shear and temperature, the apparent viscosity of a given grease is constant and may be translated into A.S.T.M. worked penetration. Figure No. 7 illustrates the principal parts of the instrument. The Zenith pump supplying grease to the viscosimeter capillary is driven by an induction motor whose constant speed is a function of currnet frequency and is relatively independent of fluctuations in line voltage. The pump, which is immersed in the thermostatically controlled oil bath, also serves as an effective heat exchanger in bringing the grease to oil bath temperature.

The pressure drop through the capillary is measured by means of two diaphragm strain gages, the resistances of which are measured electronically, automatically subtracted and recorded. The operating conditions and capillary dimensions are shown in Figure 8, together with the correlation between A.S.T.M. worked penetration and pressure drop through the viscosimeter. It should be emphasized that this correlation is valid only for the oils and fat used in this plant and significant changes in viscosity index of the oil and titre of the fat require new correlations.

CONTINUOUS BLENDING OF ADDITIVES IN LUBRICATING OIL

Two continuous production lines have been provided for blending extreme pressure additives and lubricating oils. This blending equipment is essentially the same as that used for the blending of calcium greases, but the rate of throughput is three times that used for greases and the measuring of viscosity is done by a different sized capillary tube. The equipment is in the same area as the grease blending units, and can be handled by the same operators. As contrasted with kettle or tank blending, this application of the continuous

Figure 7. Diagram of Principal component parts of Pressure Viscosimeter.

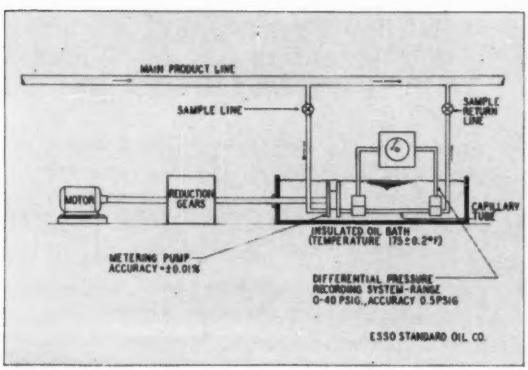
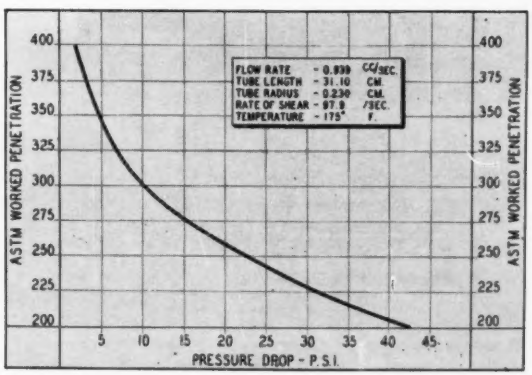


Figure 8. Chart showing Correlation-Pressure Viscosity vs. ASTM worked Penetration.



process lends itself admirably to large volume manufacture of lubricating compounds containing such liquid additives as fats or chemicals. For new installation, the low investment cost per unit output is quite attractive, and its features of automatic control and flexibility contribute to operating economy.

ECONOMICS

One economic advantage in favor of the continuous process is the fact that, as compared to kettle operation, less soap is required to meet finished grease penetration. Data establishing this point are summarized in figure 9. The higher yield of grease on the continuous unit may be due to the more complete utilization of the oil-absorbing characteristics of the soap. The fact that greases made on the continuous unit show no greater tendency to "bleed" than kettle produced greases, indicates the stability of these products.

Further economies have been obtained by consolidation of grease and compounding operations into one plant and designing for efficient filling and package handling.

In regard to utility costs, present indications are that the continuous process is comparable with the kettle process.

PACKAGE HANDLING

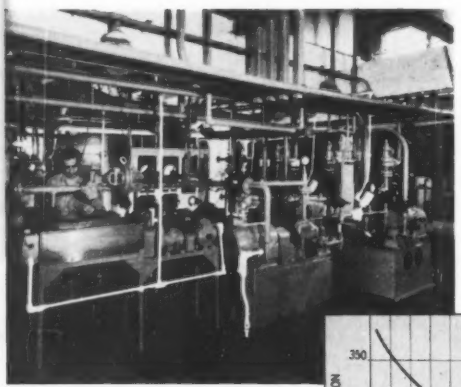
Figure No. 10 will illustrate the handling of packages. Empty packages are received by freight car or truck, unloaded onto an inclined belt conveyor, and elevated to the upper level where horizontal conveyors distribute them to any of three storage areas depending upon size or type.

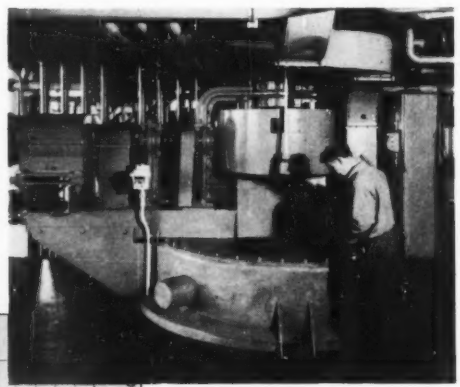
Upon completion of the daily flow plan listing the types of products and package sizes to be filled the following day, the required empty packages are fed to the conveyor line and taken down to the branding room on the lower level. There are six conveyor lines for large packages and eight lines for smaller packages in the branding room. A copy of the day's requirements is supplied to this area as an aid in setting up the proper markings on all packages.

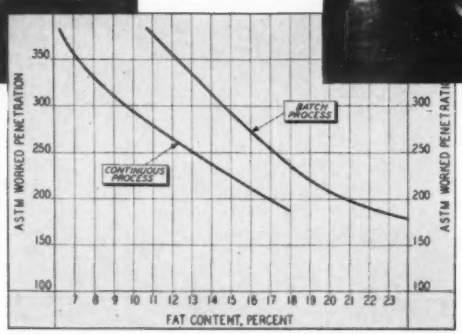
From the branding room the empty packages are conveyed to the filling room in groups, and manually switched to the proper filling lines.

The filling room contains nine conveyor lines for handling and filling packages with various greases, extreme pressure lubricants, compounded oils and straight lubricating oils. Six of the lines are provided with scales for measuring those products sold on a pound basis and three are provided with volumetric meters for measuring those products sold on a gallon basis. Quick acting valves are used to control the flow of products not filled continuously.

On the package filling lines from the continuous units, space consideration dictated the choice of a single conveyor line for each product rather than two parallel conveyors as would be the normal practice. It has previously been pointed out that the Lancaster discharges against controlled back pressure and complete shut-off of the grease stream at the filling line would interfere with balanced operations. It was therefore necessary to devise a procedure for package filling on a single conveyor line which would avoid grease shut-off when swinging from filled to empty package. The method is diagrammed in figure 11.





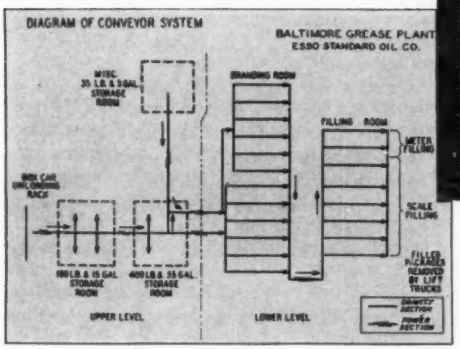


Above: **Anthony J. Gutowski, Grease Maker, Checks temperature control. Continuous Method. Baltimore Refinery, Esso Standard Oil Company.**

Figure 9. (Left) Comparison of yields Continuous vs. Batch Production.

Above: **John A. Smith, Grease Maker, inspects grease. Batch Method, Baltimore Refinery, Esso Standard Oil Company.**

Figure 10. Diagram of Conveyor System.



In this setup, which is controlled by a single lever, one grease valve is always open and one always closed. Drum "A" on the weighing scale is brought to weight, and the grease stream is directed to Drum "C" by a single movement of the control handle. Drum "B", which is partly full is moved onto the scale, and the grease stream is directed to Drum "B", which is brought to correct weight. Meanwhile, Drums "C" and "D" have been moved forward one space, and the operation repeated. Figure No. 12 is a photograph of the continuous grease drum filling line.

In the filling of weighted quantities of grease into one and ten-pound packages, advantage is taken of the remarkable uniform rate of flow from the continuous unit. This permits delivery of weighted quantities into the package merely by calibrating the time for filling. The small package filling system utilizes an electronic timer controlling a pneumatically

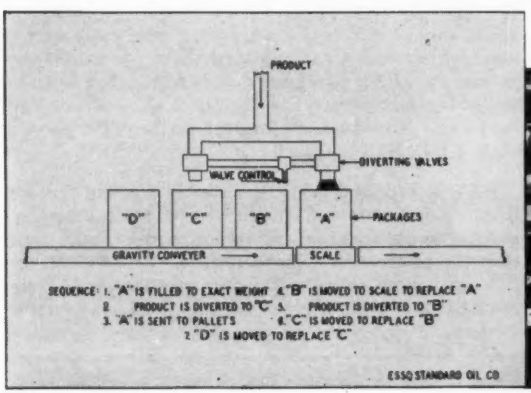
(Above) **Package filling by use of the Conveyyor Belt, Continuous Method, Baltimore Refinery, Esso Standard Oil Company.**

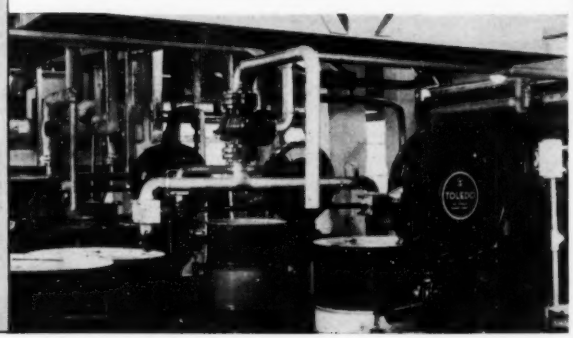
operated pair of slide valves alternately discharging into packages without shut-off of the line.

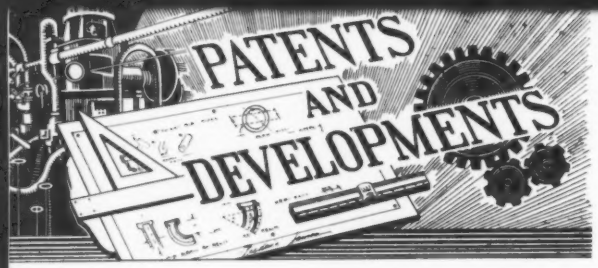
Modifications of the continuous systems just described have been used experimentally and semi-commercially for the production of sodium, lithium, and aluminum greases. Facilities for continuous manufacture of these items were not installed in the new plant because the volumes required did not warrant the purchase of the high temperature equipment needed to make the grease base. For the products required in low volume or needing the addition of a filler, kettles of various sizes are available and equipped so that they can be used either for grease making or compounding or oil blending. In addition, various outside storage tanks are equipped for air mixing, for use as blending tanks, and are manifold connected to practically every other tank in the tank field.

(1) Beerbower, Patberg, Sproule, Zimmer; Institute Spokesman, Vol. 6, Page Nos. 8 and 9, 10 and 11 (1942) Beerbower and Zimmer, U. S. Patent 2,459,483.

Figure 11. (Left) Diagram showing Continuous Filling Operation. Figure 12 (Below) Photograph of the Continuous Grease Drum Filling Line.







ADHESIVE CHASSIS GREASE—An adhesive non-spattering grease suitable for automobile chassis and related mechanisms has been covered in a recent Standard Oil Development Co. patent. Heretofore, lime or aluminum soap thickened greases have been selected because of their water resistance and, although they were provided with tackiness agents such as polybutene or latex, they have tended to spatter badly on sudden impact. Also, the adhesive agents tend to break down under shearing stresses. The present grease employs a high molecular weight copolymer of styrene and isobutylene described in U.S. 2,274,749 which increases adhesiveness, particularly of lime and aluminum stearate base type greases and is highly stable to shearing stress. The preferred copolymers are aromatic-aliphatic copolymers of polymerizable mono-olefins having a cyclic nucleus and mono-olefins having 3-8 carbon atoms, certain copolymers containing about 40-65% by weight of combined cyclic constituent, and having intrinsic viscosity of 0.6-1.5. Although styrene is preferred as the cyclic substituent, other aromatics may be employed such as alpha-methyl styrene, para-methyl styrene, para-methoxy styrene, alpha-vinyl naphthalene, indene, etc. Although isobutylene may be used as the lower olefin, use might be made of methyl 2-butene-1 or even some of the normal olefins such as propylene, n-butenes, etc. Besides these copolymers, a stringiness agent such as polyisobutylene is employed, the molecular weight of which is preferably 50,000-100,000. About 0.1-5% of copolymers and .01-3% of stringiness agent are employed.

One preferred composition consists essentially of 75-95% mineral lubricating oil, 5-25% aluminum stearate soap, .5-2% of high molecular weight copolymers of 50-60% styrene and 50-40% of isobutylene having intrinsic viscosity of about 0.6-1.5 and about .1-1% by weight of polyisobutylene having an average molecular weight of 50,000-100,000 (U.S. 2,491,055).

WATER INSOLUBLE BALL BEARING GREASE—A water insoluble grease stable to mechanical working and free from evaporation and oil leakage in anti-friction bearings running at high speeds at elevated temperatures is described in another Standard Oil Development Co. patent. In this particular case, the vehicle is an ester of aliphatic dibasic acids such as sebacic, azelaic, phthalic, malonic, succinic, etc. Specifically, the dibasic ester is one such as di-2-ethylhexyl sebacate, isobutyl sebacate, di-ethylhexyl azelate, diamyl sebacate, dibutyl phthalate, etc. These esters may be simple or mixed or they may have substituents or functional groups such as chlorine, bromine, amino, mercapto, etc. Although various metal soaps may be employed, a lithium soap is preferred and a copolymer which imparts high VI is also added, such as the styrene-isobutylene copolymer in the preceding patent.

One composition giving the desired properties is given as follows:

	Per cent
Styrene-isobutylene copolymer of approximately 20,000 molecular weight (ratio of styrene-isobutylene by weight 40/60)	5.0
Lithium stearate	15.0
Oxidation inhibitor (phenyl alpha naphthylamine)	1.0
2,6 di-tertiary butyl-p-cresol	0.4
Di-2-ethylhexyl sebacate	78.6

The di-2-ethylhexyl sebacate employed has a flash point of 450°F., kin. viscosity/100°F. of 12.64, and 3.31 at 210°F., slope of .703 and a pour of -90°F. The soap may be derived from various metals and various fatty acids and mixtures, although lithium stearate or the aluminum soap of fully saturated fish oil acids is preferred. The copolymer is preferably of the same type as that in the preceding patent. Oxidation inhibitors such as phenyl alpha naphthylamine, 2,6 di-tertiary butyl-p-cresol may be employed. The liquid lubricant need not be entirely of esters, as the mixture of ester and mineral oil is quite satisfactory (U.S. 2,491,054).

TACKY LUBRICATING GREASES—A lubricating grease of improved VI and having desirable adhesive and non-spatter properties is also disclosed in a Standard Oil Development Co. patent. In this particular patent, an ester such as di-2-ethylhexyl sebacate is employed as the vehicle, or similar esters such as esters of dibasic acids having 3-12 carbon atoms, e.g. malonic, succinic, isosuccinic, glutaric, ethyl malonic, pyrotartaric, adipic, pimelic, suberic, azelaic, and sebacic acid. However, the tackiness agent is a polymer of acrylic acid isoalkyl derivatives. For example, a suitable material is isobutyl methacrylate polymer of molecular weight in the range of 100,000-300,000.

A preferred composition given is composed of 13% by weight of lithium stearate, 86.5% of di-2-ethylhexyl sebacate and 0.5% isobutyl methacrylate. This gives a smooth, opaque stringy grease which shows less tendency to separate the oily esters than the corresponding lithium stearate-ester grease made without the polymer. Various oxidation inhibitors also may be employed, such as phenyl alpha naphthylamine, phenyl beta naphthylamine aldol alpha naphthylamine ditertiary butyl para cresol, etc. with or without synergistic agents such as ammonia-formaldehyde di-isobutyl condensation products. Carbon blacks such as acetylene blacks, silica gel, etc. may also be employed in lieu of soaps as thickening agents. Instead of isobutyl methacrylate, other esters such as isopropyl, secondary butyl and 2-ethylhexyl derivatives may be used provided their solubility characteristics and tackiness and stringiness properties in the particular lubricant are comparable with those of isobutyl methacrylate polymer (U.S. 2,491,028).

WATER RESISTING GREASES—Usually, lime base and lithium base greases are inherently water resistant and apparently do not need any improvement in this respect. However, the addition of additives such as rust inhibitors and E.P. agents often decreases the water resistance and increases emulsifiability and other detrimental properties of the lubricant.

One Socony-Vacuum Oil Co. patent discloses that such loss in water resistance can be overcome by addition to the

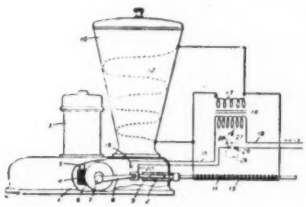
grease of .5-3% of resinates of zinc, cadmium, magnesium or calcium. The metal resinates are salts of divalent metals of group II of the periodic table with naturally occurring rosin acids such as abietic, pimaric, sapinic, sylvic and various mixtures of these which may be used as they occur naturally or polymerized or hydrogenated.

Numerous tests have been given showing the beneficial effects of these additives, including the water wash test, water absorption test and water resistance test on lithium, sodium-lithium, soda, aluminum and lime base greases. Apparently, mineral oil sulfonate rust-proofing agents are particularly potent in reducing water resistance of greases (U.S. 2,491,441).

ALUMINUM SULFONATES—Atlantic Refining Co. describes a process of producing aluminum sulfonates by heating a mixture of aluminum chloride sludge derived from a hydrocarbon conversion process and consisting essentially of an aluminum chloride-hydrocarbon complex and an oil soluble alkali metal petroleum sulfonate to a temperature between 180°F. and 210°F. to form aluminum sulfonate which is then separated from the products of the reaction (U.S. 2,491,043).

FLUORO-ETHYLENE POLYMER GREASES—DuPont has obtained a patent on the production of oils or greases having at least 25% unsaturation, obtained by heating, in an inert atmosphere at a temperature of 400°C.-700°C., a normally solid copolymer of tetrafluoro ethylene and a mono-olefinic hydrocarbon having 2-4 carbon atoms, until the copolymer is converted to a product which has the foregoing physical properties, the copolymers containing 10-60 mol percent of tetrafluoro ethylene. The preferred mono-olefinic hydrocarbon is ethylene (Can. 461,430).

LUBRICATING SYSTEM—A British firm (Tecalemit Ltd.) has obtained a patent on a lubricating system adapted to the use of a grease having a consistency normally too heavy to flow freely. It comprises a combination of a grease container for holding a supply of the grease, a pipe through which grease from the container is dispensed, a mechanism including a pump for forcing the grease from the container



and through the pipe, heating elements for applying the heat to the inner surface of the container to radiate heat inwardly from the surface of the container, and a periodically operated mechanism for heating the heating elements so that the heating periods are related to the rate of forcing the grease from the container by the mechanism so that only portions of the grease adjacent the surface of the container are sequentially heated (See cut). (U.S. 2,493,490).

Chairman T. G. Roehner, Director of the Technical Service Department, Socony-Vacuum Laboratories

At the New Orleans meeting, methods for the determination of oil separation data on greases were discussed briefly. The subject is so complicated and has so many ramifications that the entire meeting could have been devoted thereto without covering all possible details. "Oil separation" is a term similar to "water resistance" in that it has different meanings, dependent on the particular problem involved. The term "water resistance" may be used when the property in question is water repellency, water absorption, resistance to wash out, rust protection, or combinations thereof. In view of the action taken at the New Orleans meeting, it is in order to point out that the term "oil separation" may likewise be widely interpreted. For example, it may refer to: bleeding or sweating during storage of the grease in a container; occurrence of what is assumed to be clear oil, but which may actually be a thin mixture of oil and soap, in grease packed bearings; separability of the grease when subjected to pressure plus filtering action in a grease cup, metering valve, grease gun and other equipment used for applying the lubricant.

The practical significance of the above differs considerably. Bleeding in the packages is often misinterpreted as definitely predicting that when the grease is packed in bearings, the oil will run out and leave the bearings choked with straight soap or very heavy grease. This suspicion is not supported by observations in the field unless the greases are grossly, improperly formulated or poorly manufactured. Some years ago such greases might have been encountered, but the manufacture of grease has improved to the point where the number of products of that extremely poor quality on the market today is small. The free oil normally is reincorporated readily in the bulk of the grease, and, when in the bearing, movement of the bearing will quickly restore the original stability of the product.

Bleeding usually is regarded as a function of the viscosity of the mineral oil and percentage of soap. The lighter the viscosity and the lower the soap concentration, the greater will be the tendency of the greases to bleed. The separation of oil may also be said to be a function of time, surface and temperature. By surface is meant the condition of the grease in the container. Frequently no free oil will be evident until a hollow is made in the product in the container. It is well known that temperature is a factor, but often it is not recognized that as the temperature rises important changes of soap structure may occur which, in turn, will have an important effect on tendency to bleed. For an extreme example; at temperatures above 150°F., aluminum soap greases may change from a cup grease buttery structure to

(*Continued on page* 19)

GREASONALITIES

SOHIO GREETS 80th BIRTHDAY . . .

Organized on January 10, 1870 to supply the fuel for the coal oil lamps of that era, The Standard Oil Company of Ohio has completed 80 years of outstanding growth and service to the world.

In 1870, oil was a new and chaotic industry in which no standards existed. Few companies had standard specifications for their own products. The small group of Clevelanders who incorporated this new company under the laws of Ohio selected a name to assure customers that all products sold with that name would be of standard good quality.

For the first 12 years of its existence, Standard Oil of Ohio was the parent company of an organization that spread over the world. In 1882, when the Standard Oil Trust was created, Sohio became a subsidiary and remained a subsidiary until 1911 when that trust was dissolved. The year 1911 found Sohio in a new situation. Suddenly a separate and independent company, they were supplying most of Ohio with fuel oil for lamps with little capital, a small refinery, a string of bulk stations and a fleet of tank wagons.

From the day that Standard Oil Products were distributed by house-to-house selling of local peddlers or agents to this day of modern gas stations and sleek motorized distribution equipment has not been long. Sohio has progressed from supplying fuel for dim-lit lamps to supplying the public with home-heating fuel, fuel and lubrication for a fast and efficient transportation network, many necessary by-products and lubrication for the big industries that make America a land of prosperity.

From the beginning the company's growth has been built solidly on two ideals: progress and service; each an exceedingly important contribution to our American way of life.

SWAN-FINCH OIL CORPORATION ISSUES NEW LUBRICATION GUIDE

Swan-Finch Oil Corporation, New York, has just issued a new lubrication guide for tractors, trucks, buses, farm and road equipment. The 14-page publication describes in detail the properties of the nine different Motul lubricants and is reported to give accurate recommendations for their most efficient use.

Motul Lubricants are described as being superior for use in all types of heavy duty equipment. Motul H. D. Oils are described as being a series of heavy duty detergent type oils especially designed for the lubrication of high speed diesel and heavy duty gasoline motors. Motul Motors Oils, recommended for the lubrication of high-speed gasoline engines, are said to provide greater protection against the destructive effects of increased engine speeds. Claims for Motul Super Gyrol E P Gear Oils—the Universal Extreme Pressure Gear Lubricants—include highly effective protection for all types of automotive gear units. It is reported that these lubricants were developed to meet U. S. Army Specifications. Motul Improved Gear Oils are recommended for the lubrication and maintenance of gear units not requiring extreme pressure lubricants. Motul Pressure Gun and Track Roller Greases are stated to have high water resistance, to stay in bearings longer and to seal out dirt. Motul Upper Lube is reported to insure increased engine power, economy and performance. Motul Tenese No. 4 Compound is recommended for open gears, cams and dipper sticks. Motul No. 424 and No. 504 Greases are suggested for ball and roller bearings and for high temperature applications.

Copies of the new Lubrication Guide may be obtained by writing Swan-Finch Oil Corporation, New York City, or the company's district offices at Detroit, Michigan, Chicago, Illinois, or San Mateo, California.

STEWART-WARNER . . . Mr. David C. Peterson was appointed Director of Engineering and Manufacturing of Division One of the Stewart-Warner Corporation succeeding Mr. George Thomas, who became Production Consultant to the Senior Vice-President. The appointment was announced by Mr. F. A. Hiter, Senior Vice-President, and became effective January 16, 1950.

Mr. Peterson has been Director of Engineering of Stewart-Warner since 1946. His new responsibilities are confined to the company's main plant in Chicago, where lubrication equipment and automotive equipment and instruments are produced.

A native of Chicago and trained in electrical and mechanical engineering at the Armour Institute of Technology, Mr. Peterson was an engineering consultant to Diesel engine manufacturers prior to joining Stewart-Warner. He also has been in charge of engineering operations in the Continental Can Company's tin plate mills in Pittsburgh, and spent two years in England for the same company. From 1914 to 1934, he was with the Buda Company, Harvey, Illinois, rising through various engineering and manufacturing positions to become assistant to the Vice-president in Charge of Manufacturing.

Mr. Thomas, who has been with the Stewart-Warner Corporation for thirty years, was plant manager for seven years and superintendent for ten years prior to that.

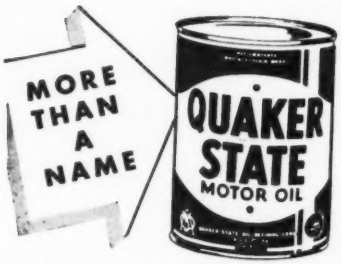
Gus Treffeisen, Distribution Sales Manager of the Alemite division of the Stewart-Warner Corporation, announced the appointment of a new assistant, Huntington Eldridge. Mr. Eldridge will handle sales activities on Alemite automotive, industrial and farm lubrication products, Versatal materials pumps and Stewart-Warner electronic wheel balancers.

(*Continued from page* 17)

a stiff stringy gel structure which may not bleed a drop of oil regardless of viscosity of oil or soap concentration.

Bleeding of grease in a bearing may or may not be objectionable, dependent on the equipment serviced. In compact fire control instruments, where migration of the separated oil to electrical connections and contacts would cause trouble, the tendency of the grease to bleed is obviously an important factor determining its suitability. When the greases are employed as lubricants for gears of speed reducers and for ball bearings of conventional motors and for like requirements, a grease which sweats a limited amount of oil may give better performance than the corresponding grease which is 100% resistant to bleeding. That amount of separation would have a negligible effect on the consistencies of the greases in-so-far as increasing the percentages of soap is concerned. The free oil, however, would have a beneficial effect which would become more evident at extremely low temperatures, because the oil would penetrate to bearing surfaces not so easily reached by grease. Many consumers of greases do not recognize that fact and erroneously reject greases which have "wet" surfaces and/or which bleed a small amount of oil.

Bleeding or separation of oil in equipment for applying greases has still another practical significance. However, it is believed that enough has already been said to show that one of the important phases of the problem of development of methods for the measurement of oil separation is the definition of that term itself. The objective of presenting the above is to provoke comments which we would be quite willing to pass along to groups working on methods and also publish in this column.



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LUBRICATING GREASES

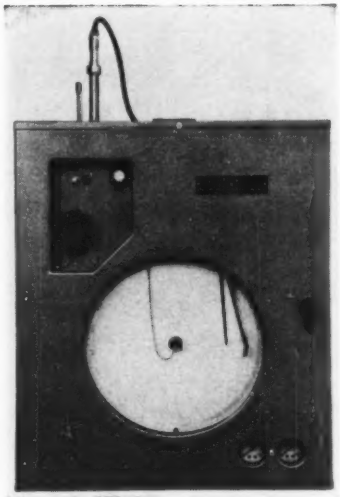
PRECISION-DOW ROBOMATIC REFRACTOMETER

In conjunction with Dow Chemical Company, Precision Scientific Company announces the development of a production control instrument, the Robomatic Refractometer. It controls the flow of industrial process streams by refractive index instantaneously, continuously and graphically records the results 24 hours a day. The Refractometer has a scope of application as wide as industry. In the saving of waste materials, in keeping a new high in quality standards, in saving of manhours, the Robomatic Refractometer is said to be unprecedented in process instrumentation. There is no similar apparatus on the market today.

The Precision-Dow Robomatic Refractometer is believed to save operators time by eliminating hand sampling. The apparatus operates directly from the stream, and there is an instant response to any product change. It provides a continuous record of the product flowing through the pipe.

In preventing serious and costly waste due to faulty methods of control, obsolete methods, manpower-failure or error, it is entirely possible that the Precision-Dow Robomatic Refractometer could easily save its entire cost, and MUCH MORE in a few hours time.

Application is found in any industry or plant where liquids which are clear enough to provide a refractive index are produced or combined. The apparatus covers the entire range of refractive indices from 1.32539 to 1.54409. It will control over the entire range to within three parts in the fifth decimal place.



Specific applications are so numerous as to defy listing but some of them are: for the production of plastics, synthetic rubber, petroleum products; for the manufacture of ammonia, pharmaceuticals, bleaches, vinegars — all aqueous and alcoholic solutions not having suspended solids; pipe line distribution for pilot plant operations in industry or in laboratory research.

In operation, the process liquid is pumped into a constant temperature bath surrounding the refractometer prism. A sodium light behind the bath sends light through the liquid to the eyepiece and also to a photoelectric cell. The response of the photoelectric cell actuates a recording pen. Movements of the pen effect pressure changes in an air controller which in turn operates diaphragm valves in the process pipes.

The instrument comprises a dipping

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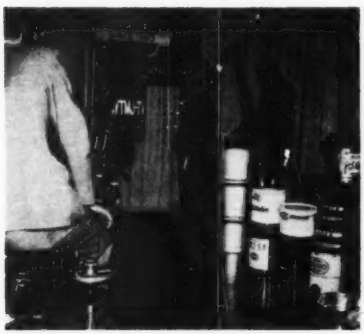
refractometer, a constant temperature bath with a range from 35°F. to 150°F., a recorder actuated by a photoelectric cell and amplifier, and an air operated controller.

The Robomatic Refractometer is constructed to be flush mounted in an instrument panel and can be installed at any distance from the process pipes. A sheet metal housing is finished in Green Hammerloid enamel and is fitted with a locking door having a gas-tight seal. The instrument is compact—overall dimensions are 19" deep, 34" high, 24" wide.

NEWS ITEM

The Can Crusher manufactured by Geuder, Paeschke and Frey Company is the star of "Salute to Wisconsin" television program on station WTMJ-TV in Milwaukee.



In the above picture, Lloyd Mueller, Vice-president in Charge of Sales, demonstrates to the Master of Ceremonies, George Comte, how the Crusher flattens an empty can with one sweep of the handle. It solves the empty can problem for filling stations, garages and other places where empty quart tin cans accumulate.

The "Salute to Wisconsin" program is sponsored by the Marine National Exchange Bank of Milwaukee and features a different industrial or commercial firm each week.

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The metals it will polish are the carbon steels, alloy steels including stainless, aluminum alloys, nickel alloys, copper, brass, etc. The Polisher has exclusive features which make it especially suitable for laboratory use in the metal industries.

The Precision Electrolytic Polisher is comprised of two units—the Electrolyte Bath and the Rectifier Assembly. The Bath is made up of a glass jar placed inside a stainless steel insulated jacket. Space between jar and jacket allows flow of cooling water around the jar to keep electrolytes below critical temperatures. This feature allows safe use of a greater variety of electrolytes.

The Rectifier Assembly is equipped to convert AC power source to DC of proper voltage and amperage. All necessary controls are supplied such as a DC voltmeter, ammeter, timer, pilot light, reversing switch, safety fuse and polarized connection for the single cord to the bath unit. Only one electrical connection is required, that is 115 volts, 60 cycles, 450 watts.

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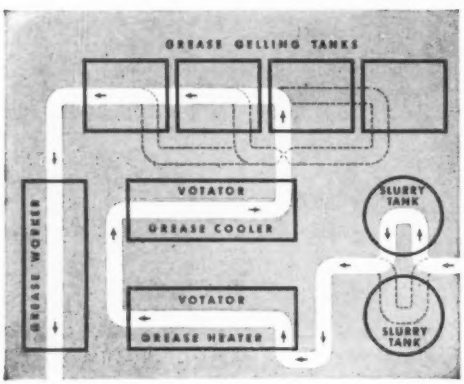

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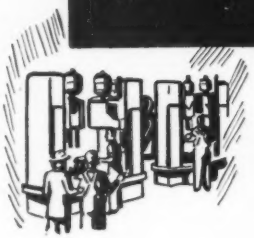

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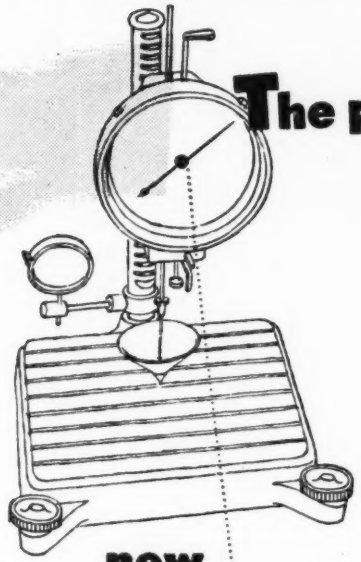

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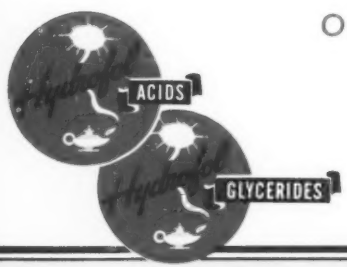
45° Bleached Winter	0.25	132-138	80-90	100-115	32-35	44-46° F	500-510° F
38° Natural Winter	2.00	132-138	80-90	100-115	32-35	44-46° F	500-510° F
38° Bleached Winter	0.25	132-138	80-90	100-115	32-35	44-46° F	500-510° F
Bodied	8.50	170-180	48-54	290-310	30-35	45-50° F	500-510° F



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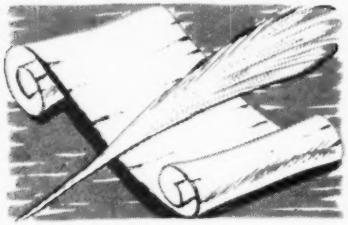

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